

TIME-RELATED PERFORMANCE OF SOIL MIX TECHNOLOGY STABILISED/SOLIDIFIED SOILS FROM TWO CONTAMINATED SITES

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ABSTRACT

Soil Mixing Technology (SMT) has recently emerged as a cost effective, efficient, versatile and low risk method for the implementation of in-situ remediation treatments. It has been employed in the UK since the mid-1990s for a number of applications. However, contaminants remain in the ground, which create uncertainties relating to the long-term stability of the treated materials. To date, there are only a limited number of field validation studies available, with sufficient treatment records. Therefore, assessment of the time-related long-term performance is essential for the validation of this technology and its wider acceptability amongst stakeholders.

The PhD research focuses on the long-term and time-related performance of in-situ application of SMT, and the binding mechanism involved. In this research, both real time site samples and model samples were addressed (each with a different range of organic and/or inorganic contaminants), to understand the binding mechanism of binders, contaminants and soils, so as to provide a much needed validation of the longevity of the technology and extend the application of this technique. Different binders were used including Portland cement (PC), ground granulated blastfurnace slag (GGBS), pulverised fuel ash (PFA), MgO, and modified clays. Samples were subjected to unconfined compressive strength (UCS), different leaching tests, and a modified sequential extraction test along with microstructure analyses. The results confirm that cement-based S/S treatment can achieve satisfactory durability up to 17 years and thus is a reliable technique for long-term remediation of contaminated soil. Under various contaminant levels and binder levels, due to varied nature of binders, not all binders showed the same efficiency in treating contaminated soil. The binding mechanisms under different binders, the benefit of using novel binders, time-dependent performance and the difference between the laboratory work and the field work are also detailed in this thesis.